

SEQUENCE LISTING

<110> BARRETT, ALAN
MCARTHUR, MONICA

<120> METHODS AND COMPOSITIONS CONCERNING ALTERED YELLOW
FEVER VIRUS STRAINS

<130> UTFG:255WO

<140> UNKNOWN

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<150> 60/397,440

<151> 2002-07-19

<160> 4

<170> PatentIn Ver. 2.1

<210> 1

<211> 10862

<212> DNA

<213> Yellow fever virus

<220>

<221> CDS

<222> (119)..(10351)

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atg tct ggt cgt aaa gct cag gga aaa acc ctg ggc gtc aat atg gta 166
Met Ser Gly Arg Lys Ala Gln Gly Lys Thr Leu Gly Val Asn Met Val
1 5 10 15

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Arg Arg Gly Val Arg Ser Leu Ser Asn Lys Ile Lys Gln Lys Thr Lys
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caa att gga aac aga cct gga cct tca aga ggt gtt caa gga ttt atc 262
Gln Ile Gly Asn Arg Pro Gly Pro Ser Arg Gly Val Gln Gly Phe Ile
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Phe Phe Phe Leu Phe Asn Ile Leu Thr Gly Lys Lys Ile Thr Ala His
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Leu Lys Arg Leu Trp Lys Met Leu Asp Pro Arg Gln Gly Leu Ala Val
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Leu Arg Lys Val Lys Arg Val Val Ala Ser Leu Met Arg Gly Leu Ser

2

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Leu	Gly	Met	Leu	Leu	Met	Thr	Gly	Gly	Val	Thr	Leu	Val	Arg	Lys	Asn	
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Arg	Trp	Leu	Leu	Leu	Asn	Val	Thr	Ser	Glu	Asp	Leu	Gly	Lys	Thr	Phe	
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tct	gtg	ggc	aca	ggc	aac	tgc	aca	aca	aac	att	ttg	gaa	gcc	aag	tac	598
Ser	Val	Gly	Thr	Gly	Asn	Cys	Thr	Thr	Asn	Ile	Leu	Glu	Ala	Lys	Tyr	
145					150					155					160	
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Trp	Cys	Pro	Asp	Ser	Met	Glu	Tyr	Asn	Cys	Pro	Asn	Leu	Ser	Pro	Arg	
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gag	gag	cca	gat	gac	att	gat	tgc	tgg	tgc	tat	ggg	gtg	gaa	aac	gtt	694
Glu	Glu	Pro	Asp	Asp	Ile	Asp	Cys	Trp	Cys	Tyr	Gly	Val	Glu	Asn	Val	
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cgg	caa	gaa	aaa	tgg	atg	act	gga	aga	atg	ggg	gaa	agg	caa	ctc	caa	838
Arg	Gln	Glu	Lys	Trp	Met	Thr	Gly	Arg	Met	Gly	Glu	Arg	Gln	Leu	Gln	
225					230					235					240	
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Lys	Ile	Glu	Arg	Trp	Phe	Val	Arg	Asn	Pro	Phe	Phe	Ala	Val	Thr	Ala	
				245					250				255			
ctg	acc	att	gcc	tac	ctt	gtg	gga	agc	aac	atg	acg	caa	cga	gtc	gtg	934
Leu	Thr	Ile	Ala	Tyr	Leu	Val	Gly	Ser	Asn	Met	Thr	Gln	Arg	Val	Val	
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Ile	Ala	Leu	Leu	Val	Leu	Ala	Val	Gly	Pro	Ala	Tyr	Ser	Ala	His	Cys	
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Trp	Val	Ser	Ala	Thr	Leu	Glu	Gln	Asp	Lys	Cys	Val	Thr	Val	Met	Ala	

3

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Pro Asp Lys Pro	Ser Leu Asp Ile Ser Leu Glu Thr Val Ala Ile Asp						
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aga cct gct gag	gtg agg aaa gtg tgt tac aat gca gtt ctc act cat	1174					
Arg Pro Ala Glu Val Arg Lys Val Cys Tyr Asn Ala Val Leu Thr His							
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Val Lys Ile Asn Asp Lys Cys Pro Ser Thr Gly Glu Ala His Leu Ala							
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gaa gag aac gaa ggg gac aat gcg tgc aag cgc act tat tct gat aga	1270						
Glu Glu Asn Glu Gly Asp Asn Ala Cys Lys Arg Thr Tyr Ser Asp Arg							
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Gly Trp Gly Asn Gly Cys Gly Leu Phe Gly Lys Gly Ser Ile Val Ala							
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Cys Ala Lys Phe Thr Cys Ala Lys Ser Met Ser Leu Phe Glu Val Asp							
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Gln Thr Lys Ile Gln Tyr Val Ile Arg Ala Gln Leu His Val Gly Ala							
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Met His His Leu Val Glu Phe Glu Pro Pro His Ala Ala Thr Ile Arg							
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gcc tca acc aat gat gat gaa gtg ctg att gag gtg aac cca cct ttt Ala Ser Thr Asn Asp Asp Glu Val Leu Ile Glu Val Asn Pro Pro Phe 645 650 655			2086
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Cys	Gly	Leu	Asn	Ser	Val	Asp	Ser	Leu	Glu	His	Glu	Met	Trp	Arg	Ser	
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Arg	Ala	Asp	Glu	Ile	Asn	Ala	Ile	Phe	Glu	Glu	Asn	Glu	Val	Asp	Ile	
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tct	gtt	gtc	gtg	cag	gat	cca	aag	aat	gtt	tac	cag	aga	gga	act	cat	2758
Ser	Val	Val	Val	Gln	Asp	Pro	Lys	Asn	Val	Tyr	Gln	Arg	Gly	Thr	His	
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Ile	Asp	Gly	Lys	Ser	Arg	Lys	Glu	Cys	Pro	Phe	Ser	Asn	Arg	Val	Trp	
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aat	tct	ttc	cag	ata	gag	gag	ttt	ggg	acg	gga	gtg	ttc	acc	aca	cgc	2950
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Val	Tyr	Met	Asp	Ala	Val	Phe	Glu	Tyr	Thr	Ile	Asp	Cys	Asp	Gly	Ser	
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Ile	Leu	Gly	Ala	Ala	Val	Asn	Gly	Lys	Lys	Ser	Ala	His	Gly	Ser	Pro	
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Thr	Phe	Trp	Met	Gly	Ser	His	Glu	Val	Asn	Gly	Thr	Trp	Met	Ile	His	

980										985										990										
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Thr Leu Glu Ala Leu Asp Tyr Lys Glu Cys Glu Trp Pro Leu Thr His																														
995 1000 1005																														
acg att gga aca tca gtt gaa gag agt gaa atg ttc atg ccg aga tca	3190																													
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Ile Gly Gly Pro Val Ser Ser His Asn His Ile Pro Gly Tyr Lys Val																														
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Gln Thr Asn Gly Pro Trp Met Gln Val Pro Leu Glu Val Lys Arg Glu																														
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Leu Ser Glu Glu Lys Val Pro Trp Asp Gln Val Val Met Thr Ser Leu				
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gcc ttg gtt ggg gct gcc ctc cat cca ttt gct ctt ctg ctg gtc ctt				4534
Ala Leu Val Gly Ala Ala Leu His Pro Phe Ala Leu Leu Leu Val Leu				
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Ala Gly Trp Leu Phe His Val Arg Gly Ala Arg Arg Ser Gly Asp Val				
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Gln Arg Gly Val Gly Val Ala Gln Gly Gly Val Phe His Thr Met Trp				
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His Val Thr Arg Gly Ala Phe Leu Val Arg Asn Gly Lys Lys Leu Ile				
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Pro Ser Trp Ala Ser Val Lys Glu Asp Leu Val Ala Tyr Gly Gly Ser				
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Ala Ala Val Pro Gly Lys Asn Val Val Asn Val Gln Thr Lys Pro Ser				
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	1635	1640	1645	
gtg tcc gcc ata tcc cag act gag gtg aag gaa gaa gga aag gag gag				5110
Val Ser Ala Ile Ser Gln Thr Glu Val Lys Glu Glu Gly Lys Glu Glu				

1650	1655	1660	
ctc caa gag atc ccg aca atg cta aag aaa gga atg aca act gtc ctt			5158
Leu Gln Glu Ile Pro Thr Met Leu Lys Lys Gly Met Thr Thr Val Leu			
1665	1670	1675	1680
gat ttt cat cct gga gct ggg aag aca aga cgt ttc ctc cca cag atc			5206
Asp Phe His Pro Gly Ala Gly Lys Thr Arg Arg Phe Leu Pro Gln Ile			
1685	1690	1695	
ttg gcc gag tgc gca cgg aga cgc ttg cgc act ctt gtg ttg gcc ccc			5254
Leu Ala Glu Cys Ala Arg Arg Arg Leu Arg Thr Leu Val Leu Ala Pro			
1700	1705	1710	
acc agg gtt gtt ctt tct gaa atg aag gag gct ttt cac ggc ctg gac			5302
Thr Arg Val Val Leu Ser Glu Met Lys Glu Ala Phe His Gly Leu Asp			
1715	1720	1725	
gtg aaa ttc cac aca cag gct ttt tcc gct cac ggc agc ggg aga gaa			5350
Val Lys Phe His Thr Gln Ala Phe Ser Ala His Gly Ser Gly Arg Glu			
1730	1735	1740	
gtc att gat gct atg tgc cat gcc acc cta act tac agg atg ttg gaa			5398
Val Ile Asp Ala Met Cys His Ala Thr Leu Thr Tyr Arg Met Leu Glu			
1745	1750	1755	1760
cca act agg gtt gtt aac tgg gaa gtg atc att atg gat gaa gcc cat			5446
Pro Thr Arg Val Val Asn Trp Glu Val Ile Ile Met Asp Glu Ala His			
1765	1770	1775	
ttt ttg gat cca gct agc ata gcc gct aga ggt tgg gca gcg cac aga			5494
Phe Leu Asp Pro Ala Ser Ile Ala Ala Arg Gly Trp Ala Ala His Arg			
1780	1785	1790	
gct agg gca aat gaa agt gca aca atc ttg atg aca gcc aca ccg cct			5542
Ala Arg Ala Asn Glu Ser Ala Thr Ile Leu Met Thr Ala Thr Pro Pro			
1795	1800	1805	
ggg act agt gat gaa ttt cca cat tca aat ggt gaa ata gaa gat gtt			5590
Gly Thr Ser Asp Glu Phe Pro His Ser Asn Gly Glu Ile Glu Asp Val			
1810	1815	1820	
caa acg gac ata ccc agt gag ccc tgg aac aca ggg cat gac tgg atc			5638
Gln Thr Asp Ile Pro Ser Glu Pro Trp Asn Thr Gly His Asp Trp Ile			
1825	1830	1835	1840
ctg gct gac aaa agg ccc acg gca tgg ttc ctt cca tcc atc aga gct			5686
Leu Ala Asp Lys Arg Pro Thr Ala Trp Phe Leu Pro Ser Ile Arg Ala			
1845	1850	1855	
gca aat gtc atg gct gcc tct ttg cgt aag gct gga aag agt gtg gtg			5734
Ala Asn Val Met Ala Ala Ser Leu Arg Lys Ala Gly Lys Ser Val Val			
1860	1865	1870	
gtc ctg aac agg aaa acc ttt gag aga gaa tac ccc acg ata aag cag			5782
Val Leu Asn Arg Lys Thr Phe Glu Arg Glu Tyr Pro Thr Ile Lys Gln			

1875	1880	1885	
aag aaa cct gac ttt ata ttg gcc act gac ata gct gaa atg gga gcc Lys Lys Pro Asp Phe Ile Leu Ala Thr Asp Ile Ala Glu Met Gly Ala 1890 1895 1900			5830
aac ctt tgc gtg gag cga gtg ctg gat tgc agg acg gct ttt aag cct Asn Leu Cys Val Glu Arg Val Leu Asp Cys Arg Thr Ala Phe Lys Pro 1905 1910 1915 1920			5878
gtg ctt gtg gat gaa ggg agg aag gtg gca ata aaa ggg cca ctt cgt Val Leu Val Asp Glu Gly Arg Lys Val Ala Ile Lys Gly Pro Leu Arg 1925 1930 1935			5926
atc tcc gca tcc tct gct gct caa agg agg ggg cgc att ggg aga aat Ile Ser Ala Ser Ser Ala Ala Gln Arg Arg Gly Arg Ile Gly Arg Asn 1940 1945 1950			5974
ccc aac aga gat gga gac tca tac tac tat tct gag cct aca agt gaa Pro Asn Arg Asp Gly Asp Ser Tyr Tyr Ser Glu Pro Thr Ser Glu 1955 1960 1965			6022
aat aat gcc cac cac gtc tgc tgg ttg gag gcc tca atg ctc ttg gac Asn Asn Ala His His Val Cys Trp Leu Glu Ala Ser Met Leu Leu Asp 1970 1975 1980			6070
aac atg gag gtg agg ggt gga atg gtc gcc cca ctc tat ggc gtt gaa Asn Met Glu Val Arg Gly Gly Met Val Ala Pro Leu Tyr Gly Val Glu 1985 1990 1995 2000			6118
gga act aaa aca cca gtt tcc cct ggt gaa atg aga ctg agg gat gac Gly Thr Lys Thr Pro Val Ser Pro Gly Glu Met Arg Leu Arg Asp Asp 2005 2010 2015			6166
cag agg aaa gtc ttc aga gaa cta gtg agg aat tgt gac ctg ccc gtt Gln Arg Lys Val Phe Arg Glu Leu Val Arg Asn Cys Asp Leu Pro Val 2020 2025 2030			6214
tgg ctt tcg tgg caa gtg gcc aag gct ggt ttg aag acg aat gat cgt Trp Leu Ser Trp Gln Val Ala Lys Ala Gly Leu Lys Thr Asn Asp Arg 2035 2040 2045			6262
aag tgg tgt ttt gaa ggc cct gag gaa cat gag atc ttg aat gac agc Lys Trp Cys Phe Glu Gly Pro Glu Glu His Glu Ile Leu Asn Asp Ser 2050 2055 2060			6310
ggt gaa aca gtg aag tgc agg gct cct gga gga gca aag aag cct ctg Gly Glu Thr Val Lys Cys Arg Ala Pro Gly Gly Ala Lys Lys Pro Leu 2065 2070 2075 2080			6358
cgc cca agg tgg tgt gat gaa agg gtg tca tct gac cag agt gcg ctg Arg Pro Arg Trp Cys Asp Glu Arg Val Ser Ser Asp Gln Ser Ala Leu 2085 2090 2095			6406
tct gaa ttt att aag ttt gct gaa ggt agg agg gga gct gct gaa gtg Ser Glu Phe Ile Lys Phe Ala Glu Gly Arg Arg Gly Ala Ala Glu Val 2100 2105 2110 2115 2120			6454

2100	2105	2110	
cta gtt gtg ctg agt gaa ctc cct gat ttc ctg gct aaa aaa ggt gga Leu Val Val Leu Ser Glu Leu Pro Asp Phe Leu Ala Lys Lys Gly Gly			6502
2115	2120	2125	
gag gca atg gat acc atc agt gtg ttt ctc cac tct gag gaa ggc tct Glu Ala Met Asp Thr Ile Ser Val Phe Leu His Ser Glu Glu Gly Ser			6550
2130	2135	2140	
agg gct tac cgc aat gca cta tca atg atg cct gag gca atg aca ata Arg Ala Tyr Arg Asn Ala Leu Ser Met Met Pro Glu Ala Met Thr Ile			6598
2145	2150	2155	2160
gtc atg ctg ttt ata ctg gct gga ctc ctg aca tcg gga atg gtc atc Val Met Leu Phe Ile Leu Ala Gly Leu Leu Thr Ser Gly Met Val Ile			6646
2165	2170	2175	
ttt ttc atg tct ccc aaa ggc atc agt aga atg tct atg gcg atg ggc Phe Phe Met Ser Pro Lys Gly Ile Ser Arg Met Ser Met Ala Met Gly			6694
2180	2185	2190	
aca atg gcc ggc tgt gga tat ctc atg ttc ctt gga ggc gtc aaa ccc Thr Met Ala Gly Cys Gly Tyr Leu Met Phe Leu Gly Gly Val Lys Pro			6742
2195	2200	2205	
act cac atc tcc tat atc atg ctc ata ttc ttt gtc ctg atg gtg gtt Thr His Ile Ser Tyr Ile Met Leu Ile Phe Phe Val Leu Met Val Val			6790
2210	2215	2220	
gtg atc ccc gag cca ggg caa caa agg tcc atc caa gac aac caa gtg Val Ile Pro Glu Pro Gly Gln Gln Arg Ser Ile Gln Asp Asn Gln Val			6838
2225	2230	2235	2240
gca tac ctc att att ggc atc ctg acg ctg gtt tca gcg gtg gca gcc Ala Tyr Leu Ile Ile Gly Ile Leu Thr Leu Val Ser Ala Val Ala Ala			6886
2245	2250	2255	
aac gag cta ggc atg ctg gag aaa acc aaa gag gac ctc ttt ggg aag Asn Glu Leu Gly Met Leu Glu Lys Thr Lys Glu Asp Leu Phe Gly Lys			6934
2260	2265	2270	
aag aac tta att cca tct agt gct tca ccc tgg agt tgg ccg gat ctt Lys Asn Leu Ile Pro Ser Ser Ala Ser Pro Trp Ser Trp Pro Asp Leu			6982
2275	2280	2285	
gac ctg aag cca gga gct gcc tgg aca gtg tac gtt ggc att gtt aca Asp Leu Lys Pro Gly Ala Ala Trp Thr Val Tyr Val Gly Ile Val Thr			7030
2290	2295	2300	
atg ctc tct cca atg ttg cac cac tgg atc aaa gtc gaa tat ggc aac Met Leu Ser Pro Met Leu His His Trp Ile Lys Val Glu Tyr Gly Asn			7078
2305	2310	2315	2320
ctg tct ctg tct gga ata gcc cag tca gcc tca gtc ctt tct ttc atg Leu Ser Leu Ser Gly Ile Ala Gln Ser Ala Ser Val Leu Ser Phe Met			7126

2325	2330	2335	
gac aag ggg ata cca ttc atg aag atg aat atc tcg gtc ata atg ctg Asp Lys Gly Ile Pro Phe Met Lys Met Asn Ile Ser Val Ile Met Leu 2340 2345 2350			7174
ctg gtc agt ggc tgg aat tca ata aca gtg atg cct ctg ctc tgt ggc Leu Val Ser Gly Trp Asn Ser Ile Thr Val Met Pro Leu Leu Cys Gly 2355 2360 2365			7222
ata ggg tgc gcc atg ctc cac tgg tct ctc att tta cct gga atc aaa Ile Gly Cys Ala Met Leu His Trp Ser Leu Ile Leu Pro Gly Ile Lys 2370 2375 2380			7270
gcg cag cag tca aag ctt gca cag aga agg gtg ttc cat ggc gtt gcc Ala Gln Gln Ser Lys Leu Ala Gln Arg Arg Val Phe His Gly Val Ala 2385 2390 2395 2400			7318
aag aac cct gtg gtt gat ggg aat cca aca gtt gac att gag gaa gct Lys Asn Pro Val Val Asp Gly Asn Pro Thr Val Asp Ile Glu Glu Ala 2405 2410 2415			7366
cct gaa atg cct gcc ctt tat gag aag aaa ctg gct cta tat ctc ctt Pro Glu Met Pro Ala Leu Tyr Glu Lys Lys Leu Ala Leu Tyr Leu Leu 2420 2425 2430			7414
ctt gct ctc agc cta gct tct gtt gcc atg tgc aga acg ccc ttt tca Leu Ala Leu Ser Leu Ala Ser Val Ala Met Cys Arg Thr Pro Phe Ser 2435 2440 2445			7462
ttg gct gaa ggc att gtc cta gca tca gct gcc tca ggg ccg ctc ata Leu Ala Glu Gly Ile Val Leu Ala Ser Ala Ala Ser Gly Pro Leu Ile 2450 2455 2460			7510
gag gga aac acc agc ctt ctt tgg aat gga ccc atg gct gtc tcc atg Glu Gly Asn Thr Ser Leu Leu Trp Asn Gly Pro Met Ala Val Ser Met 2465 2470 2475 2480			7558
aca gga gtc atg agg ggg aat cac tat gct ttt gtg gga gtc atg tac Thr Gly Val Met Arg Gly Asn His Tyr Ala Phe Val Gly Val Met Tyr 2485 2490 2495			7606
aat cta tgg aag atg aaa act gga cgc cgg ggg agc gcg aat gga aaa Asn Leu Trp Lys Met Lys Thr Gly Arg Arg Gly Ser Ala Asn Gly Lys 2500 2505 2510			7654
act ttg ggt gaa gtc tgg aag agg gaa ctg aat ctg ttg gac aag cga Thr Leu Gly Glu Val Trp Lys Arg Glu Leu Asn Leu Leu Asp Lys Arg 2515 2520 2525			7702
cag ttt gag ttg tat aaa agg acc gac att gtg gag gtg gat cgt gat Gln Phe Glu Leu Tyr Lys Arg Thr Asp Ile Val Glu Val Asp Arg Asp 2530 2535 2540			7750
acg gca cgc agg cat ttg gcc gaa ggg aag gtg gac acc ggg gtg gcg Thr Ala Arg Arg His Leu Ala Glu Gly Lys Val Asp Thr Gly Val Ala			7798

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2545	2550	2555	2560	
gtc tcc agg ggg acc gca aag tta agg tgg ttc cat gag cgt ggc tat				7846
Val Ser Arg Gly Thr Ala Lys Leu Arg Trp Phe His Glu Arg Gly Tyr				
	2565	2570	2575	
gtc aag ctg gaa ggt agg gtg att gac ctg ggg tgt ggc cgc gga ggc				7894
Val Lys Leu Glu Gly Arg Val Ile Asp Leu Gly Cys Gly Arg Gly Gly				
	2580	2585	2590	
tgg tgt tac tac gct gct gcg caa aag gaa gtg agt ggg gtc aaa gga				7942
Trp Cys Tyr Tyr Ala Ala Ala Gln Lys Glu Val Ser Gly Val Lys Gly				
	2595	2600	2605	
ttt act ctt gga aga gac ggc cat gag aaa ccc atg aat gtg caa agt				7990
Phe Thr Leu Gly Arg Asp Gly His Glu Lys Pro Met Asn Val Gln Ser				
	2610	2615	2620	
ctg gga tgg aac atc atc acc ttc aag gac aaa act gat atc cac cgc				8038
Leu Gly Trp Asn Ile Ile Thr Phe Lys Asp Lys Thr Asp Ile His Arg				
	2625	2630	2635	2640
cta gaa cca gtg aaa tgt gac acc ctt ttg tgt gac att gga gag tca				8086
Leu Glu Pro Val Lys Cys Asp Thr Leu Leu Cys Asp Ile Gly Glu Ser				
	2645	2650	2655	
tca tcg tca tcg gtc aca gag ggg gaa agg acc gtg aga gtt ctt gat				8134
Ser Ser Ser Ser Val Thr Glu Gly Glu Arg Thr Val Arg Val Leu Asp				
	2660	2665	2670	
act gta gaa aaa tgg ctg gct tgt ggg gtt gac aac ttc tgt gtg aag				8182
Thr Val Glu Lys Trp Leu Ala Cys Gly Val Asp Asn Phe Cys Val Lys				
	2675	2680	2685	
gtg tta gct cca tac atg cca gat gtt ctc gag aaa ctg gaa ttg ctc				8230
Val Leu Ala Pro Tyr Met Pro Asp Val Leu Glu Lys Leu Glu Leu Leu				
	2690	2695	2700	
caa agg agg ttt ggc gga aca gtg atc agg aac cct ctc tcc agg aat				8278
Gln Arg Arg Phe Gly Gly Thr Val Ile Arg Asn Pro Leu Ser Arg Asn				
	2705	2710	2715	2720
tcc act cat gaa atg tac tac gtg tct gga gcc cgc agc aat gtc aca				8326
Ser Thr His Glu Met Tyr Tyr Val Ser Gly Ala Arg Ser Asn Val Thr				
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ttt act gtg aac caa aca tcc cgc ctc ctg atg agg aga atg agg cgt				8374
Phe Thr Val Asn Gln Thr Ser Arg Leu Leu Met Arg Arg Met Arg Arg				
	2740	2745	2750	
cca act gga aaa gtg acc ctg gag gct gac gtc atc ctc cca att ggg				8422
Pro Thr Gly Lys Val Thr Leu Glu Ala Asp Val Ile Leu Pro Ile Gly				
	2755	2760	2765	
aca cgc agt gtt gag aca gac aag gga ccc ctg gac aaa gag gcc ata				8470
Thr Arg Ser Val Glu Thr Asp Lys Gly Pro Leu Asp Lys Glu Ala Ile				

2770	2775	2780	
gaa gaa agg gtt gag agg ata aaa tct gag tac atg acc tct tgg ttt			8518
Glu Glu Arg Val Glu Arg Ile Lys Ser Glu Tyr Met Thr Ser Trp Phe			
2785	2790	2795	2800
tat gac aat gac aac ccc tac agg acc tgg cac tac tgt ggc tcc tat			8566
Tyr Asp Asn Asp Asn Pro Tyr Arg Thr Trp His Tyr Cys Gly Ser Tyr			
2805	2810	2815	
gtc aca aaa acc tca gga agt gcg gcg agc atg gta aat ggt gtt att			8614
Val Thr Lys Thr Ser Gly Ser Ala Ala Ser Met Val Asn Gly Val Ile			
2820	2825	2830	
aaa att ctg aca tat cca tgg gac agg ata gag gag gtc aca aga atg			8662
Lys Ile Leu Thr Tyr Pro Trp Asp Arg Ile Glu Glu Val Thr Arg Met			
2835	2840	2845	
gca atg act gac aca acc cct ttt gga cag caa aga gtg ttt aaa gaa			8710
Ala Met Thr Asp Thr Thr Pro Phe Gly Gln Gln Arg Val Phe Lys Glu			
2850	2855	2860	
aaa gtt gac acc aga gca aag gat cca cca gcg gga act agg aag atc			8758
Lys Val Asp Thr Arg Ala Lys Asp Pro Pro Ala Gly Thr Arg Lys Ile			
2865	2870	2875	2880
atg aaa gtt gtc aac agg tgg ctg ttc cgc cac ctg gcc aga gaa aag			8806
Met Lys Val Val Asn Arg Trp Leu Phe Arg His Leu Ala Arg Glu Lys			
2885	2890	2895	
aac ccc aga ctg tgc aca aag gaa gaa ttt att gca aaa gtc cga agt			8854
Asn Pro Arg Leu Cys Thr Lys Glu Glu Phe Ile Ala Lys Val Arg Ser			
2900	2905	2910	
cat gca gcc att gga gct tac ctg gaa gaa caa gaa cag tgg aag act			8902
His Ala Ala Ile Gly Ala Tyr Leu Glu Glu Gln Glu Gln Trp Lys Thr			
2915	2920	2925	
gcc aat gag gct gtc caa gac cca aag ttc tgg gaa ctg gtg gat gaa			8950
Ala Asn Glu Ala Val Gln Asp Pro Lys Phe Trp Glu Leu Val Asp Glu			
2930	2935	2940	
gaa agg aag ctg cac caa caa ggc agg tgt cgg act tgt gtg tac aac			8998
Glu Arg Lys Leu His Gln Gln Gly Arg Cys Arg Thr Cys Val Tyr Asn			
2945	2950	2955	2960
atg atg ggg aaa aga gag aag aag ctg tca gag ttt ggg aaa gca aag			9046
Met Met Gly Lys Arg Glu Lys Lys Leu Ser Glu Phe Gly Lys Ala Lys			
2965	2970	2975	
gga agc cgt gcc ata tgg tat atg tgg ctg gga gcg cgg tat ctt gag			9094
Gly Ser Arg Ala Ile Trp Tyr Met Trp Leu Gly Ala Arg Tyr Leu Glu			
2980	2985	2990	
ttt gag gcc ctg gga ttc ctg aat gag gac cat tgg gct tcc agg gaa			9142
Phe Glu Ala Leu Gly Phe Leu Asn Glu Asp His Trp Ala Ser Arg Glu			

2995	3000	3005	
aac tca gga gga gga gtg gaa ggc att ggc tta caa tac cta gga tat			9190
Asn Ser Gly Gly Gly Val Glu Gly Ile Gly Leu Gln Tyr Leu Gly Tyr			
3010	3015	3020	
gtg atc aga gac ctg gct gca atg gat ggt ggt gga ttc tac gcg gat			9238
Val Ile Arg Asp Leu Ala Ala Met Asp Gly Gly Gly Phe Tyr Ala Asp			
3025	3030	3035	3040
gac acc gct gga tgg gac acg cgc atc aca gag gca gac ctt gat gat			9286
Asp Thr Ala Gly Trp Asp Thr Arg Ile Thr Glu Ala Asp Leu Asp Asp			
3045	3050	3055	
gaa cag gag atc ttg aac tac atg agc cca cat cac aaa aaa ctg gca			9334
Glu Gln Glu Ile Leu Asn Tyr Met Ser Pro His His Lys Lys Leu Ala			
3060	3065	3070	
caa gca gtg atg gaa atg aca tac aag aac aaa gtg gtg aaa gtg ttg			9382
Gln Ala Val Met Glu Met Thr Tyr Lys Asn Lys Val Val Lys Val Leu			
3075	3080	3085	
aga cca gcc cca gga ggg aaa gcc tac atg gat gtc ata agt cga cga			9430
Arg Pro Ala Pro Gly Gly Lys Ala Tyr Met Asp Val Ile Ser Arg Arg			
3090	3095	3100	
gac cag aga gga tcc ggg cag gta gtg act tat gct ctg aac acc atc			9478
Asp Gln Arg Gly Ser Gly Gln Val Val Thr Tyr Ala Leu Asn Thr Ile			
3105	3110	3115	3120
acc aac ttg aaa gtc caa ttg atc aga atg gca gaa gca gag atg gtg			9526
Thr Asn Leu Lys Val Gln Leu Ile Arg Met Ala Glu Ala Glu Met Val			
3125	3130	3135	
ata cat cac caa cat gtt caa gat tgt gat gaa tca gtt ctg acc agg			9574
Ile His His Gln His Val Gln Asp Cys Asp Glu Ser Val Leu Thr Arg			
3140	3145	3150	
ctg gag gca tgg ctc act gag cac gga tgt aac aga ctg aag agg atg			9622
Leu Glu Ala Trp Leu Thr Glu His Gly Cys Asn Arg Leu Lys Arg Met			
3155	3160	3165	
gcg gtg agt gga gac gac tgt gtg gtc cgg ccc atc gat gac agg ttc			9670
Ala Val Ser Gly Asp Asp Cys Val Val Arg Pro Ile Asp Asp Arg Phe			
3170	3175	3180	
ggc ctg gcc ctg tcc cat ctc aac gcc atg tcc aag gtt aga aag gac			9718
Gly Leu Ala Leu Ser His Leu Asn Ala Met Ser Lys Val Arg Lys Asp			
3185	3190	3195	3200
ata tct gaa tgg cag cca tca aaa ggg tgg aat gat tgg gag aat gtg			9766
Ile Ser Glu Trp Gln Pro Ser Lys Gly Trp Asn Asp Trp Glu Asn Val			
3205	3210	3215	
ccc ttc tgt tcc cac cac ttc cat gaa cta cag ctg aag gat ggc agg			9814
Pro Phe Cys Ser His His Phe His Glu Leu Gln Leu Lys Asp Gly Arg			

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3220	3225	3230	
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Arg Ile Val Val Pro Cys Arg Glu Gln Asp Glu Leu Ile Gly Arg Gly			
3235	3240	3245	
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Arg Val Ser Pro Gly Asn Gly Trp Met Ile Lys Glu Thr Ala Cys Leu			
3250	3255	3260	
agc aaa gcc tat gcc aac atg tgg tca ctg atg tat ttt cac aaa agg			9958
Ser Lys Ala Tyr Ala Asn Met Trp Ser Leu Met Tyr Phe His Lys Arg			
3265	3270	3275 3280	
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Asp Met Arg Leu Leu Ser Leu Ala Val Ser Ser Ala Val Pro Thr Ser			
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Trp Val Pro Gln Gly Arg Thr Thr Trp Ser Ile His Gly Lys Gly Glu			
3300	3305	3310	
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Trp Met Thr Thr Glu Asp Met Leu Glu Val Trp Asn Arg Val Trp Ile			
3315	3320	3325	
acc aac aac cca cac atg cag gac aag aca atg gtg aaa aaa tgg aga			10150
Thr Asn Asn Pro His Met Gln Asp Lys Thr Met Val Lys Lys Trp Arg			
3330	3335	3340	
gat gtc cct tat cta acc aag aga caa gac aag ctg tgc gga tca ctg			10198
Asp Val Pro Tyr Leu Thr Lys Arg Gln Asp Lys Leu Cys Gly Ser Leu			
3345	3350	3355 3360	
att gga atg acc aat agg gcc acc tgg gcc tcc cac atc cat tta gtc			10246
Ile Gly Met Thr Asn Arg Ala Thr Trp Ala Ser His Ile His Leu Val			
3365	3370	3375	
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Ile His Arg Ile Arg Thr Leu Ile Gly Gln Glu Lys Tyr Thr Asp Tyr			
3380	3385	3390	
cta aca gtc atg gac agg tat tct gtg gat gct gac ctg caa ctg ggt			10342
Leu Thr Val Met Asp Arg Tyr Ser Val Asp Ala Asp Leu Gln Leu Gly			
3395	3400	3405	
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Glu Leu Ile			
3410			
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17

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<213> Yellow fever virus

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 Gln Ile Gly Asn Arg Pro Gly Pro Ser Arg Gly Val Gln Gly Phe Ile
 35 40 45
 Phe Phe Phe Leu Phe Asn Ile Leu Thr Gly Lys Lys Ile Thr Ala His
 50 55 60
 Leu Lys Arg Leu Trp Lys Met Leu Asp Pro Arg Gln Gly Leu Ala Val
 65 70 75 80
 Leu Arg Lys Val Lys Arg Val Val Ala Ser Leu Met Arg Gly Leu Ser
 85 90 95
 Ser Arg Lys Arg Arg Ser His Asp Val Leu Thr Val Gln Phe Leu Ile
 100 105 110
 Leu Gly Met Leu Leu Met Thr Gly Gly Val Thr Leu Val Arg Lys Asn
 115 120 125
 Arg Trp Leu Leu Leu Asn Val Thr Ser Glu Asp Leu Gly Lys Thr Phe
 130 135 140
 Ser Val Gly Thr Gly Asn Cys Thr Thr Asn Ile Leu Glu Ala Lys Tyr
 145 150 155 160
 Trp Cys Pro Asp Ser Met Glu Tyr Asn Cys Pro Asn Leu Ser Pro Arg
 165 170 175
 Glu Glu Pro Asp Asp Ile Asp Cys Trp Cys Tyr Gly Val Glu Asn Val
 180 185 190
 Arg Val Ala Tyr Gly Lys Cys Asp Ser Ala Gly Arg Ser Arg Arg Ser
 195 200 205

Met His His Leu Val Glu Phe Glu Pro Pro His Ala Ala Thr Ile Arg
 515 520 525
 Val Leu Ala Leu Gly Asn Gln Glu Gly Ser Leu Lys Thr Ala Leu Thr
 530 535 540
 Gly Ala Met Arg Val Thr Lys Asp Thr Asn Asp Asn Asn Leu Tyr Lys
 545 550 555 560
 Leu His Gly Gly His Val Ser Cys Arg Val Lys Leu Ser Ala Leu Thr
 565 570 575
 Leu Lys Gly Thr Ser Tyr Lys Ile Cys Thr Asp Lys Met Phe Phe Val
 580 585 590
 Lys Asn Pro Thr Asp Thr Gly His Gly Thr Val Val Met Gln Val Lys
 595 600 605
 Val Ser Lys Gly Ala Pro Cys Arg Ile Pro Val Ile Val Ala Asp Asp
 610 615 620
 Leu Thr Ala Ala Ile Asn Lys Gly Ile Leu Val Thr Val Asn Pro Ile
 625 630 635 640
 Ala Ser Thr Asn Asp Asp Glu Val Leu Ile Glu Val Asn Pro Pro Phe
 645 650 655
 Gly Asp Ser Tyr Ile Ile Val Gly Arg Gly Asp Ser Arg Leu Thr Tyr
 660 665 670
 Gln Trp His Lys Glu Gly Ser Ser Ile Gly Lys Leu Phe Thr Gln Thr
 675 680 685
 Met Lys Gly Val Glu Arg Leu Ala Val Met Gly Asp Thr Ala Trp Asp
 690 695 700
 Phe Ser Ser Ala Gly Gly Phe Phe Thr Ser Val Gly Lys Gly Ile His
 705 710 715 720
 Thr Val Phe Gly Ser Ala Phe Gln Gly Leu Phe Gly Gly Leu Asn Trp
 725 730 735
 Ile Thr Lys Val Ile Met Gly Ala Val Leu Ile Trp Val Gly Ile Asn
 740 745 750
 Thr Arg Asn Met Thr Met Ser Met Ser Met Ile Leu Val Gly Val Ile
 755 760 765
 Met Met Phe Leu Ser Leu Gly Val Gly Ala Asp Gln Gly Cys Ala Ile
 770 775 780
 Asn Phe Gly Lys Arg Glu Leu Lys Cys Gly Asp Gly Ile Phe Ile Phe
 785 790 795 800
 Arg Asp Ser Asp Asp Trp Leu Asn Lys Tyr Ser Tyr Tyr Pro Glu Asp

20

805										810					815				
Pro	Val	Lys	Leu	Ala	Ser	Ile	Val	Lys	Ala	Ser	Phe	Glu	Glu	Gly	Lys				
			820					825					830						
Cys	Gly	Leu	Asn	Ser	Val	Asp	Ser	Leu	Glu	His	Glu	Met	Trp	Arg	Ser				
		835					840					845							
Arg	Ala	Asp	Glu	Ile	Asn	Ala	Ile	Phe	Glu	Glu	Asn	Glu	Val	Asp	Ile				
		850				855					860								
Ser	Val	Val	Val	Gln	Asp	Pro	Lys	Asn	Val	Tyr	Gln	Arg	Gly	Thr	His				
865					870					875					880				
Pro	Phe	Ser	Arg	Ile	Arg	Asp	Gly	Leu	Gln	Tyr	Gly	Trp	Lys	Thr	Trp				
				885					890						895				
Gly	Lys	Asn	Leu	Val	Phe	Ser	Pro	Gly	Arg	Lys	Asn	Gly	Ser	Phe	Ile				
			900					905					910						
Ile	Asp	Gly	Lys	Ser	Arg	Lys	Glu	Cys	Pro	Phe	Ser	Asn	Arg	Val	Trp				
		915					920					925							
Asn	Ser	Phe	Gln	Ile	Glu	Glu	Phe	Gly	Thr	Gly	Val	Phe	Thr	Thr	Arg				
		930				935					940								
Val	Tyr	Met	Asp	Ala	Val	Phe	Glu	Tyr	Thr	Ile	Asp	Cys	Asp	Gly	Ser				
945					950					955					960				
Ile	Leu	Gly	Ala	Ala	Val	Asn	Gly	Lys	Lys	Ser	Ala	His	Gly	Ser	Pro				
				965					970					975					
Thr	Phe	Trp	Met	Gly	Ser	His	Glu	Val	Asn	Gly	Thr	Trp	Met	Ile	His				
			980					985						990					
Thr	Leu	Glu	Ala	Leu	Asp	Tyr	Lys	Glu	Cys	Glu	Trp	Pro	Leu	Thr	His				
		995					1000						1005						
Thr	Ile	Gly	Thr	Ser	Val	Glu	Glu	Ser	Glu	Met	Phe	Met	Pro	Arg	Ser				
		1010				1015					1020								
Ile	Gly	Gly	Pro	Val	Ser	Ser	His	Asn	His	Ile	Pro	Gly	Tyr	Lys	Val				
1025					1030					1035					1040				
Gln	Thr	Asn	Gly	Pro	Trp	Met	Gln	Val	Pro	Leu	Glu	Val	Lys	Arg	Glu				
				1045					1050					1055					
Ala	Cys	Pro	Gly	Thr	Ser	Val	Ile	Ile	Asp	Gly	Asn	Cys	Asp	Gly	Arg				
			1060						1065				1070						
Gly	Lys	Ser	Thr	Arg	Ser	Thr	Thr	Asp	Ser	Gly	Lys	Val	Ile	Pro	Glu				
			1075				1080					1085							
Trp	Cys	Cys	Arg	Ser	Cys	Thr	Met	Pro	Pro	Val	Ser	Phe	His	Gly	Ser				
					1095							1100							

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Arg	Arg	Ala	Ile	Asp	Leu	Pro	Thr	His	Glu	Asn	His	Gly	Leu	Lys	Thr
210						215					220				
Arg	Gln	Glu	Lys	Trp	Met	Thr	Gly	Arg	Met	Gly	Glu	Arg	Gln	Leu	Gln
225					230					235					240
Lys	Ile	Glu	Arg	Trp	Phe	Val	Arg	Asn	Pro	Phe	Phe	Ala	Val	Thr	Ala
				245					250					255	
Leu	Thr	Ile	Ala	Tyr	Leu	Val	Gly	Ser	Asn	Met	Thr	Gln	Arg	Val	Val
			260					265					270		
Ile	Ala	Leu	Leu	Val	Leu	Ala	Val	Gly	Pro	Ala	Tyr	Ser	Ala	His	Cys
		275					280					285			
Ile	Gly	Ile	Thr	Asp	Arg	Asp	Phe	Ile	Glu	Gly	Val	His	Gly	Gly	Thr
	290					295					300				
Trp	Val	Ser	Ala	Thr	Leu	Glu	Gln	Asp	Lys	Cys	Val	Thr	Val	Met	Ala
305					310					315					320
Pro	Asp	Lys	Pro	Ser	Leu	Asp	Ile	Ser	Leu	Glu	Thr	Val	Ala	Ile	Asp
				325					330					335	
Arg	Pro	Ala	Glu	Val	Arg	Lys	Val	Cys	Tyr	Asn	Ala	Val	Leu	Thr	His
			340					345					350		
Val	Lys	Ile	Asn	Asp	Lys	Cys	Pro	Ser	Thr	Gly	Glu	Ala	His	Leu	Ala
	355						360					365			
Glu	Glu	Asn	Glu	Gly	Asp	Asn	Ala	Cys	Lys	Arg	Thr	Tyr	Ser	Asp	Arg
	370					375					380				
Gly	Trp	Gly	Asn	Gly	Cys	Gly	Leu	Phe	Gly	Lys	Gly	Ser	Ile	Val	Ala
385					390					395					400
Cys	Ala	Lys	Phe	Thr	Cys	Ala	Lys	Ser	Met	Ser	Leu	Phe	Glu	Val	Asp
			405						410					415	
Gln	Thr	Lys	Ile	Gln	Tyr	Val	Ile	Arg	Ala	Gln	Leu	His	Val	Gly	Ala
			420					425					430		
Lys	Gln	Glu	Asn	Trp	Thr	Thr	Asp	Ile	Lys	Thr	Leu	Lys	Phe	Asp	Ala
		435					440					445			
Leu	Ser	Gly	Ser	Gln	Glu	Val	Glu	Phe	Ile	Gly	Tyr	Gly	Lys	Ala	Thr
	450					455				460					
Leu	Glu	Cys	Gln	Val	Gln	Thr	Ala	Val	Asp	Phe	Gly	Asn	Ser	Tyr	Ile
465					470					475					480
Ala	Glu	Met	Glu	Thr	Glu	Ser	Trp	Ile	Val	Asp	Arg	Gln	Trp	Ala	Gln
				485					490					495	
Asp	Leu	Thr	Leu	Pro	Trp	Gln	Ser	Gly	Ser	Gly	Gly	Val	Trp	Arg	Glu
			500					505					510		

Met His His Leu Val Glu Phe Glu Pro Pro His Ala Ala Thr Ile Arg
 515 520 525
 Val Leu Ala Leu Gly Asn Gln Glu Gly Ser Leu Lys Thr Ala Leu Thr
 530 535 540
 Gly Ala Met Arg Val Thr Lys Asp Thr Asn Asp Asn Asn Leu Tyr Lys
 545 550 555 560
 Leu His Gly Gly His Val Ser Cys Arg Val Lys Leu Ser Ala Leu Thr
 565 570 575
 Leu Lys Gly Thr Ser Tyr Lys Ile Cys Thr Asp Lys Met Phe Phe Val
 580 585 590
 Lys Asn Pro Thr Asp Thr Gly His Gly Thr Val Val Met Gln Val Lys
 595 600 605
 Val Ser Lys Gly Ala Pro Cys Arg Ile Pro Val Ile Val Ala Asp Asp
 610 615 620
 Leu Thr Ala Ala Ile Asn Lys Gly Ile Leu Val Thr Val Asn Pro Ile
 625 630 635 640
 Ala Ser Thr Asn Asp Asp Glu Val Leu Ile Glu Val Asn Pro Pro Phe
 645 650 655
 Gly Asp Ser Tyr Ile Ile Val Gly Arg Gly Asp Ser Arg Leu Thr Tyr
 660 665 670
 Gln Trp His Lys Glu Gly Ser Ser Ile Gly Lys Leu Phe Thr Gln Thr
 675 680 685
 Met Lys Gly Val Glu Arg Leu Ala Val Met Gly Asp Thr Ala Trp Asp
 690 695 700
 Phe Ser Ser Ala Gly Gly Phe Phe Thr Ser Val Gly Lys Gly Ile His
 705 710 715 720
 Thr Val Phe Gly Ser Ala Phe Gln Gly Leu Phe Gly Gly Leu Asn Trp
 725 730 735
 Ile Thr Lys Val Ile Met Gly Ala Val Leu Ile Trp Val Gly Ile Asn
 740 745 750
 Thr Arg Asn Met Thr Met Ser Met Ser Met Ile Leu Val Gly Val Ile
 755 760 765
 Met Met Phe Leu Ser Leu Gly Val Gly Ala Asp Gln Gly Cys Ala Ile
 770 775 780
 Asn Phe Gly Lys Arg Glu Leu Lys Cys Gly Asp Gly Ile Phe Ile Phe
 785 790 795 800
 Arg Asp Ser Asp Asp Trp Leu Asn Lys Tyr Ser Tyr Tyr Pro Glu Asp

20

805										810					815				
Pro	Val	Lys	Leu	Ala	Ser	Ile	Val	Lys	Ala	Ser	Phe	Glu	Glu	Gly	Lys				
			820					825					830						
Cys	Gly	Leu	Asn	Ser	Val	Asp	Ser	Leu	Glu	His	Glu	Met	Trp	Arg	Ser				
		835					840					845							
Arg	Ala	Asp	Glu	Ile	Asn	Ala	Ile	Phe	Glu	Glu	Asn	Glu	Val	Asp	Ile				
	850					855					860								
Ser	Val	Val	Val	Gln	Asp	Pro	Lys	Asn	Val	Tyr	Gln	Arg	Gly	Thr	His				
865					870					875					880				
Pro	Phe	Ser	Arg	Ile	Arg	Asp	Gly	Leu	Gln	Tyr	Gly	Trp	Lys	Thr	Trp				
				885					890					895					
Gly	Lys	Asn	Leu	Val	Phe	Ser	Pro	Gly	Arg	Lys	Asn	Gly	Ser	Phe	Ile				
			900					905					910						
Ile	Asp	Gly	Lys	Ser	Arg	Lys	Glu	Cys	Pro	Phe	Ser	Asn	Arg	Val	Trp				
	915						920					925							
Asn	Ser	Phe	Gln	Ile	Glu	Glu	Phe	Gly	Thr	Gly	Val	Phe	Thr	Thr	Arg				
	930					935					940								
Val	Tyr	Met	Asp	Ala	Val	Phe	Glu	Tyr	Thr	Ile	Asp	Cys	Asp	Gly	Ser				
945					950					955					960				
Ile	Leu	Gly	Ala	Ala	Val	Asn	Gly	Lys	Lys	Ser	Ala	His	Gly	Ser	Pro				
				965					970					975					
Thr	Phe	Trp	Met	Gly	Ser	His	Glu	Val	Asn	Gly	Thr	Trp	Met	Ile	His				
			980					985					990						
Thr	Leu	Glu	Ala	Leu	Asp	Tyr	Lys	Glu	Cys	Glu	Trp	Pro	Leu	Thr	His				
	995					1000						1005							
Thr	Ile	Gly	Thr	Ser	Val	Glu	Glu	Ser	Glu	Met	Phe	Met	Pro	Arg	Ser				
	1010					1015				1020									
Ile	Gly	Gly	Pro	Val	Ser	Ser	His	Asn	His	Ile	Pro	Gly	Tyr	Lys	Val				
1025					1030					1035				1040					
Gln	Thr	Asn	Gly	Pro	Trp	Met	Gln	Val	Pro	Leu	Glu	Val	Lys	Arg	Glu				
			1045					1050					1055						
Ala	Cys	Pro	Gly	Thr	Ser	Val	Ile	Ile	Asp	Gly	Asn	Cys	Asp	Gly	Arg				
		1060						1065				1070							
Gly	Lys	Ser	Thr	Arg	Ser	Thr	Thr	Asp	Ser	Gly	Lys	Val	Ile	Pro	Glu				
	1075					1080						1085							
Trp	Cys	Cys	Arg	Ser	Cys	Thr	Met	Pro	Pro	Val	Ser	Phe	His	Gly	Ser				
	1090					1095						1100							

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Asp Gly Cys Trp Tyr Pro Met Glu Ile Arg Pro Arg Lys Thr His Glu
 1105 1110 1115 1120
 Ser His Leu Val Arg Ser Trp Val Thr Ala Gly Glu Ile His Ala Val
 1125 1130 1135
 Pro Phe Gly Leu Val Ser Met Met Ile Ala Met Glu Val Val Leu Arg
 1140 1145 1150
 Lys Arg Gln Gly Pro Lys Gln Met Leu Val Gly Gly Val Val Leu Leu
 1155 1160 1165
 Gly Ala Met Leu Val Gly Gln Val Thr Leu Leu Asp Leu Leu Lys Leu
 1170 1175 1180
 Thr Val Ala Val Gly Leu His Phe His Glu Met Asn Asn Gly Gly Asp
 1185 1190 1195 1200
 Ala Met Tyr Met Ala Leu Ile Ala Ala Phe Ser Ile Arg Pro Gly Leu
 1205 1210 1215
 Leu Ile Gly Phe Gly Leu Arg Thr Leu Trp Ser Pro Arg Glu Arg Leu
 1220 1225 1230
 Val Leu Thr Leu Gly Ala Ala Met Val Glu Ile Ala Leu Gly Gly Val
 1235 1240 1245
 Met Gly Gly Leu Trp Lys Tyr Leu Asn Ala Val Ser Leu Cys Ile Leu
 1250 1255 1260
 Thr Ile Asn Ala Val Ala Ser Arg Lys Ala Ser Asn Thr Ile Leu Pro
 1265 1270 1275 1280
 Leu Met Ala Leu Leu Thr Pro Val Thr Met Ala Glu Val Arg Leu Ala
 1285 1290 1295
 Ala Met Phe Phe Cys Ala Val Val Ile Ile Gly Val Leu His Gln Asn
 1300 1305 1310
 Phe Lys Asp Thr Ser Met Gln Lys Thr Ile Pro Leu Val Ala Leu Thr
 1315 1320 1325
 Leu Thr Ser Tyr Leu Gly Leu Thr Gln Pro Phe Leu Gly Leu Cys Ala
 1330 1335 1340
 Phe Leu Ala Thr Arg Ile Phe Gly Arg Arg Ser Ile Pro Val Asn Glu
 1345 1350 1355 1360
 Ala Leu Ala Ala Ala Gly Leu Val Gly Val Leu Ala Gly Leu Ala Phe
 1365 1370 1375
 Gln Glu Met Glu Asn Phe Leu Gly Pro Ile Ala Val Gly Gly Leu Leu
 1380 1385 1390
 Met Met Leu Val Ser Val Ala Gly Arg Val Asp Gly Leu Glu Leu Lys
 1395 1400 1405

Lys Leu Gly Glu Val Ser Trp Glu Glu Glu Ala Glu Ile Ser Gly Ser
 1410 1415 1420
 Ser Ala Arg Tyr Asp Val Ala Leu Ser Glu Gln Gly Glu Phe Lys Leu
 1425 1430 1435 1440
 Leu Ser Glu Glu Lys Val Pro Trp Asp Gln Val Val Met Thr Ser Leu
 1445 1450 1455
 Ala Leu Val Gly Ala Ala Leu His Pro Phe Ala Leu Leu Leu Val Leu
 1460 1465 1470
 Ala Gly Trp Leu Phe His Val Arg Gly Ala Arg Arg Ser Gly Asp Val
 1475 1480 1485
 Leu Trp Asp Ile Pro Thr Pro Lys Ile Ile Glu Glu Cys Glu His Leu
 1490 1495 1500
 Glu Asp Gly Ile Tyr Gly Ile Phe Gln Ser Thr Phe Leu Gly Ala Ser
 1505 1510 1515 1520
 Gln Arg Gly Val Gly Val Ala Gln Gly Gly Val Phe His Thr Met Trp
 1525 1530 1535
 His Val Thr Arg Gly Ala Phe Leu Val Arg Asn Gly Lys Lys Leu Ile
 1540 1545 1550
 Pro Ser Trp Ala Ser Val Lys Glu Asp Leu Val Ala Tyr Gly Gly Ser
 1555 1560 1565
 Trp Lys Leu Glu Gly Arg Trp Asp Gly Glu Glu Glu Val Gln Leu Ile
 1570 1575 1580
 Ala Ala Val Pro Gly Lys Asn Val Val Asn Val Gln Thr Lys Pro Ser
 1585 1590 1595 1600
 Leu Phe Lys Val Arg Asn Gly Gly Glu Ile Gly Ala Val Ala Leu Asp
 1605 1610 1615
 Tyr Pro Ser Gly Thr Ser Gly Ser Pro Ile Val Asn Arg Asn Gly Glu
 1620 1625 1630
 Val Ile Gly Leu Tyr Gly Asn Gly Ile Leu Val Gly Asp Asn Ser Phe
 1635 1640 1645
 Val Ser Ala Ile Ser Gln Thr Glu Val Lys Glu Glu Gly Lys Glu Glu
 1650 1655 1660
 Leu Gln Glu Ile Pro Thr Met Leu Lys Lys Gly Met Thr Thr Val Leu
 1665 1670 1675 1680
 Asp Phe His Pro Gly Ala Gly Lys Thr Arg Arg Phe Leu Pro Gln Ile
 1685 1690 1695
 Leu Ala Glu Cys Ala Arg Arg Arg Leu Arg Thr Leu Val Leu Ala Pro

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1700	1705	1710
Thr Arg Val Val Leu Ser Glu Met Lys Glu Ala Phe His Gly Leu Asp 1715 1720 1725		
Val Lys Phe His Thr Gln Ala Phe Ser Ala His Gly Ser Gly Arg Glu 1730 1735 1740		
Val Ile Asp Ala Met Cys His Ala Thr Leu Thr Tyr Arg Met Leu Glu 1745 1750 1755 1760		
Pro Thr Arg Val Val Asn Trp Glu Val Ile Ile Met Asp Glu Ala His 1765 1770 1775		
Phe Leu Asp Pro Ala Ser Ile Ala Ala Arg Gly Trp Ala Ala His Arg 1780 1785 1790		
Ala Arg Ala Asn Glu Ser Ala Thr Ile Leu Met Thr Ala Thr Pro Pro 1795 1800 1805		
Gly Thr Ser Asp Glu Phe Pro His Ser Asn Gly Glu Ile Glu Asp Val 1810 1815 1820		
Gln Thr Asp Ile Pro Ser Glu Pro Trp Asn Thr Gly His Asp Trp Ile 1825 1830 1835 1840		
Leu Ala Asp Lys Arg Pro Thr Ala Trp Phe Leu Pro Ser Ile Arg Ala 1845 1850 1855		
Ala Asn Val Met Ala Ala Ser Leu Arg Lys Ala Gly Lys Ser Val Val 1860 1865 1870		
Val Leu Asn Arg Lys Thr Phe Glu Arg Glu Tyr Pro Thr Ile Lys Gln 1875 1880 1885		
Lys Lys Pro Asp Phe Ile Leu Ala Thr Asp Ile Ala Glu Met Gly Ala 1890 1895 1900		
Asn Leu Cys Val Glu Arg Val Leu Asp Cys Arg Thr Ala Phe Lys Pro 1905 1910 1915 1920		
Val Leu Val Asp Glu Gly Arg Lys Val Ala Ile Lys Gly Pro Leu Arg 1925 1930 1935		
Ile Ser Ala Ser Ser Ala Ala Gln Arg Arg Gly Arg Ile Gly Arg Asn 1940 1945 1950		
Pro Asn Arg Asp Gly Asp Ser Tyr Tyr Tyr Ser Glu Pro Thr Ser Glu 1955 1960 1965		
Asn Asn Ala His His Val Cys Trp Leu Glu Ala Ser Met Leu Leu Asp 1970 1975 1980		
Asn Met Glu Val Arg Gly Gly Met Val Ala Pro Leu Tyr Gly Val Glu 1985 1990 1995 2000		

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Gly Thr Lys Thr Pro Val Ser Pro Gly Glu Met Arg Leu Arg Asp Asp
 2005 2010 2015
 Gln Arg Lys Val Phe Arg Glu Leu Val Arg Asn Cys Asp Leu Pro Val
 2020 2025 2030
 Trp Leu Ser Trp Gln Val Ala Lys Ala Gly Leu Lys Thr Asn Asp Arg
 2035 2040 2045
 Lys Trp Cys Phe Glu Gly Pro Glu Glu His Glu Ile Leu Asn Asp Ser
 2050 2055 2060
 Gly Glu Thr Val Lys Cys Arg Ala Pro Gly Gly Ala Lys Lys Pro Leu
 2065 2070 2075 2080
 Arg Pro Arg Trp Cys Asp Glu Arg Val Ser Ser Asp Gln Ser Ala Leu
 2085 2090 2095
 Ser Glu Phe Ile Lys Phe Ala Glu Gly Arg Arg Gly Ala Ala Glu Val
 2100 2105 2110
 Leu Val Val Leu Ser Glu Leu Pro Asp Phe Leu Ala Lys Lys Gly Gly
 2115 2120 2125
 Glu Ala Met Asp Thr Ile Ser Val Phe Leu His Ser Glu Glu Gly Ser
 2130 2135 2140
 Arg Ala Tyr Arg Asn Ala Leu Ser Met Met Pro Glu Ala Met Thr Ile
 2145 2150 2155 2160
 Val Met Leu Phe Ile Leu Ala Gly Leu Leu Thr Ser Gly Met Val Ile
 2165 2170 2175
 Phe Phe Met Ser Pro Lys Gly Ile Ser Arg Met Ser Met Ala Met Gly
 2180 2185 2190
 Thr Met Ala Gly Cys Gly Tyr Leu Met Phe Leu Gly Gly Val Lys Pro
 2195 2200 2205
 Thr His Ile Ser Tyr Ile Met Leu Ile Phe Phe Val Leu Met Val Val
 2210 2215 2220
 Val Ile Pro Glu Pro Gly Gln Gln Arg Ser Ile Gln Asp Asn Gln Val
 2225 2230 2235 2240
 Ala Tyr Leu Ile Ile Gly Ile Leu Thr Leu Val Ser Ala Val Ala Ala
 2245 2250 2255
 Asn Glu Leu Gly Met Leu Glu Lys Thr Lys Glu Asp Leu Phe Gly Lys
 2260 2265 2270
 Lys Asn Leu Ile Pro Ser Ser Ala Ser Pro Trp Ser Trp Pro Asp Leu
 2275 2280 2285
 Asp Leu Lys Pro Gly Ala Ala Trp Thr Val Tyr Val Gly Ile Val Thr
 2290 2295 2300

Met Leu Ser Pro Met Leu His His Trp Ile Lys Val Glu Tyr Gly Asn
 2305 2310 2315 2320
 Leu Ser Leu Ser Gly Ile Ala Gln Ser Ala Ser Val Leu Ser Phe Met
 2325 2330 2335
 Asp Lys Gly Ile Pro Phe Met Lys Met Asn Ile Ser Val Ile Met Leu
 2340 2345 2350
 Leu Val Ser Gly Trp Asn Ser Ile Thr Val Met Pro Leu Leu Cys Gly
 2355 2360 2365
 Ile Gly Cys Ala Met Leu His Trp Ser Leu Ile Leu Pro Gly Ile Lys
 2370 2375 2380
 Ala Gln Gln Ser Lys Leu Ala Gln Arg Arg Val Phe His Gly Val Ala
 2385 2390 2395 2400
 Lys Asn Pro Val Val Asp Gly Asn Pro Thr Val Asp Ile Glu Glu Ala
 2405 2410 2415
 Pro Glu Met Pro Ala Leu Tyr Glu Lys Lys Leu Ala Leu Tyr Leu Leu
 2420 2425 2430
 Leu Ala Leu Ser Leu Ala Ser Val Ala Met Cys Arg Thr Pro Phe Ser
 2435 2440 2445
 Leu Ala Glu Gly Ile Val Leu Ala Ser Ala Ala Ser Gly Pro Leu Ile
 2450 2455 2460
 Glu Gly Asn Thr Ser Leu Leu Trp Asn Gly Pro Met Ala Val Ser Met
 2465 2470 2475 2480
 Thr Gly Val Met Arg Gly Asn His Tyr Ala Phe Val Gly Val Met Tyr
 2485 2490 2495
 Asn Leu Trp Lys Met Lys Thr Gly Arg Arg Gly Ser Ala Asn Gly Lys
 2500 2505 2510
 Thr Leu Gly Glu Val Trp Lys Arg Glu Leu Asn Leu Leu Asp Lys Arg
 2515 2520 2525
 Gln Phe Glu Leu Tyr Lys Arg Thr Asp Ile Val Glu Val Asp Arg Asp
 2530 2535 2540
 Thr Ala Arg Arg His Leu Ala Glu Gly Lys Val Asp Thr Gly Val Ala
 2545 2550 2555 2560
 Val Ser Arg Gly Thr Ala Lys Leu Arg Trp Phe His Glu Arg Gly Tyr
 2565 2570 2575
 Val Lys Leu Glu Gly Arg Val Ile Asp Leu Gly Cys Gly Arg Gly Gly
 2580 2585 2590
 Trp Cys Tyr Tyr Ala Ala Ala Gln Lys Glu Val Ser Gly Val Lys Gly

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2595	2600	2605
Phe Thr Leu Gly Arg Asp Gly His Glu Lys Pro Met Asn Val Gln Ser 2610	2615	2620
Leu Gly Trp Asn Ile Ile Thr Phe Lys Asp Lys Thr Asp Ile His Arg 2625	2630	2635 2640
Leu Glu Pro Val Lys Cys Asp Thr Leu Leu Cys Asp Ile Gly Glu Ser 2645	2650	2655
Ser Ser Ser Ser Val Thr Glu Gly Glu Arg Thr Val Arg Val Leu Asp 2660	2665	2670
Thr Val Glu Lys Trp Leu Ala Cys Gly Val Asp Asn Phe Cys Val Lys 2675	2680	2685
Val Leu Ala Pro Tyr Met Pro Asp Val Leu Glu Lys Leu Glu Leu Leu 2690	2695	2700
Gln Arg Arg Phe Gly Gly Thr Val Ile Arg Asn Pro Leu Ser Arg Asn 2705	2710	2715 2720
Ser Thr His Glu Met Tyr Tyr Val Ser Gly Ala Arg Ser Asn Val Thr 2725	2730	2735
Phe Thr Val Asn Gln Thr Ser Arg Leu Leu Met Arg Arg Met Arg Arg 2740	2745	2750
Pro Thr Gly Lys Val Thr Leu Glu Ala Asp Val Ile Leu Pro Ile Gly 2755	2760	2765
Thr Arg Ser Val Glu Thr Asp Lys Gly Pro Leu Asp Lys Glu Ala Ile 2770	2775	2780
Glu Glu Arg Val Glu Arg Ile Lys Ser Glu Tyr Met Thr Ser Trp Phe 2785	2790	2795 2800
Tyr Asp Asn Asp Asn Pro Tyr Arg Thr Trp His Tyr Cys Gly Ser Tyr 2805	2810	2815
Val Thr Lys Thr Ser Gly Ser Ala Ala Ser Met Val Asn Gly Val Ile 2820	2825	2830
Lys Ile Leu Thr Tyr Pro Trp Asp Arg Ile Glu Glu Val Thr Arg Met 2835	2840	2845
Ala Met Thr Asp Thr Thr Pro Phe Gly Gln Gln Arg Val Phe Lys Glu 2850	2855	2860
Lys Val Asp Thr Arg Ala Lys Asp Pro Pro Ala Gly Thr Arg Lys Ile 2865	2870	2875 2880
Met Lys Val Val Asn Arg Trp Leu Phe Arg His Leu Ala Arg Glu Lys 2885	2890	2895

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Asn Pro Arg Leu Cys Thr Lys Glu Glu Phe Ile Ala Lys Val Arg Ser
 2900 2905 2910
 His Ala Ala Ile Gly Ala Tyr Leu Glu Glu Gln Glu Gln Trp Lys Thr
 2915 2920 2925
 Ala Asn Glu Ala Val Gln Asp Pro Lys Phe Trp Glu Leu Val Asp Glu
 2930 2935 2940
 Glu Arg Lys Leu His Gln Gln Gly Arg Cys Arg Thr Cys Val Tyr Asn
 2945 2950 2955 2960
 Met Met Gly Lys Arg Glu Lys Lys Leu Ser Glu Phe Gly Lys Ala Lys
 2965 2970 2975
 Gly Ser Arg Ala Ile Trp Tyr Met Trp Leu Gly Ala Arg Tyr Leu Glu
 2980 2985 2990
 Phe Glu Ala Leu Gly Phe Leu Asn Glu Asp His Trp Ala Ser Arg Glu
 2995 3000 3005
 Asn Ser Gly Gly Gly Val Glu Gly Ile Gly Leu Gln Tyr Leu Gly Tyr
 3010 3015 3020
 Val Ile Arg Asp Leu Ala Ala Met Asp Gly Gly Gly Phe Tyr Ala Asp
 3025 3030 3035 3040
 Asp Thr Ala Gly Trp Asp Thr Arg Ile Thr Glu Ala Asp Leu Asp Asp
 3045 3050 3055
 Glu Gln Glu Ile Leu Asn Tyr Met Ser Pro His His Lys Lys Leu Ala
 3060 3065 3070
 Gln Ala Val Met Glu Met Thr Tyr Lys Asn Lys Val Val Lys Val Leu
 3075 3080 3085
 Arg Pro Ala Pro Gly Gly Lys Ala Tyr Met Asp Val Ile Ser Arg Arg
 3090 3095 3100
 Asp Gln Arg Gly Ser Gly Gln Val Val Thr Tyr Ala Leu Asn Thr Ile
 3105 3110 3115 3120
 Thr Asn Leu Lys Val Gln Leu Ile Arg Met Ala Glu Ala Glu Met Val
 3125 3130 3135
 Ile His His Gln His Val Gln Asp Cys Asp Glu Ser Val Leu Thr Arg
 3140 3145 3150
 Leu Glu Ala Trp Leu Thr Glu His Gly Cys Asn Arg Leu Lys Arg Met
 3155 3160 3165
 Ala Val Ser Gly Asp Asp Cys Val Val Arg Pro Ile Asp Asp Arg Phe
 3170 3175 3180
 Gly Leu Ala Leu Ser His Leu Asn Ala Met Ser Lys Val Arg Lys Asp
 3185 3190 3195 3200

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Ile Ser Glu Trp Gln Pro Ser Lys Gly Trp Asn Asp Trp Glu Asn Val
 3205 3210 3215
 Pro Phe Cys Ser His His Phe His Glu Leu Gln Leu Lys Asp Gly Arg
 3220 3225 3230
 Arg Ile Val Val Pro Cys Arg Glu Gln Asp Glu Leu Ile Gly Arg Gly
 3235 3240 3245
 Arg Val Ser Pro Gly Asn Gly Trp Met Ile Lys Glu Thr Ala Cys Leu
 3250 3255 3260
 Ser Lys Ala Tyr Ala Asn Met Trp Ser Leu Met Tyr Phe His Lys Arg
 3265 3270 3275 3280
 Asp Met Arg Leu Leu Ser Leu Ala Val Ser Ser Ala Val Pro Thr Ser
 3285 3290 3295
 Trp Val Pro Gln Gly Arg Thr Thr Trp Ser Ile His Gly Lys Gly Glu
 3300 3305 3310
 Trp Met Thr Thr Glu Asp Met Leu Glu Val Trp Asn Arg Val Trp Ile
 3315 3320 3325
 Thr Asn Asn Pro His Met Gln Asp Lys Thr Met Val Lys Lys Trp Arg
 3330 3335 3340
 Asp Val Pro Tyr Leu Thr Lys Arg Gln Asp Lys Leu Cys Gly Ser Leu
 3345 3350 3355 3360
 Ile Gly Met Thr Asn Arg Ala Thr Trp Ala Ser His Ile His Leu Val
 3365 3370 3375
 Ile His Arg Ile Arg Thr Leu Ile Gly Gln Glu Lys Tyr Thr Asp Tyr
 3380 3385 3390
 Leu Thr Val Met Asp Arg Tyr Ser Val Asp Ala Asp Leu Gln Leu Gly
 3395 3400 3405
 Glu Leu Ile
 3410

<210> 3
 <211> 1479
 <212> DNA
 <213> Yellow fever virus

<220>
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<400> 3
 gct cac tgc att gga att act gac aga gat ttc att gag ggg gtg cat
 Ala His Cys Ile Gly Ile Thr Asp Arg Asp Phe Ile Glu Gly Val His

48

29

1			5			10			15							
gga Gly	gga Gly	act Thr	tgg Trp 20	gtt Val	tca Ser	gct Ala	acc Thr	ctg Leu 25	gag Glu	cac His	ggc Gly	aag Lys	tgt Cys 30	gtc Val	act Thr	96
gtt Val	atg Met	gcc Ala 35	cct Pro	gac Asp	aag Lys	cct Pro	tca Ser 40	ttg Leu	gac Asp	atc Ile	tca Ser	cta Leu 45	gag Glu	aca Thr	gta Val	144
gcc Ala	att Ile 50	gat Asp	gga Gly	cct Pro	gct Ala	gag Glu 55	gcg Ala	agg Arg	aaa Lys	gtg Val	tgt Cys 60	tac Tyr	aat Asn	gca Ala	gtt Val	192
ctc Leu 65	act Thr	cat His	gtg Val	aag Lys	att Ile 70	aat Asn	gac Asp	aag Lys	tgc Cys	ccc Pro 75	agc Ser	act Thr	gga Gly	gag Glu	gcc Ala 80	240
cac His	cta Leu	gct Ala	gaa Glu	gag Glu 85	aac Asn	gaa Glu	ggg Gly	gac Asp	aat Asn 90	gcg Ala	tgc Cys	aag Lys	cgc Arg	act Thr 95	tat Tyr	288
tct Ser	gat Asp	aga Arg	ggc Gly 100	tgg Trp	ggc Gly	aat Asn	ggc Gly	tgt Cys 105	ggc Gly	cta Leu	ttt Phe	ggg Gly 110	aaa Lys	ggg Gly	agc Ser	336
att Ile	gtg Val	gca Ala 115	tgc Cys	gcc Ala	aaa Lys	ttc Phe	act Thr 120	tgt Cys	gcc Ala	aaa Lys	tcc Ser	atg Met 125	agt Ser	ttg Leu	ttt Phe	384
gag Glu	gtt Val 130	gat Asp	cag Gln	acc Thr	aaa Lys	att Ile 135	cag Gln	tat Tyr	gtc Val	atc Ile	aga Arg 140	gca Ala	caa Gln	ttg Leu	cat His	432
gta Val 145	ggg Gly	gcc Ala	aag Lys	cag Gln	gaa Glu 150	aat Asn	tgg Trp	aat Asn	acc Thr	gcc Ala 155	att Ile	aag Lys	act Thr	ctc Leu	aag Lys 160	480
ttt Phe	gat Asp	gcc Ala	ctg Leu	tca Ser 165	ggc Gly	tcc Ser	cag Gln	gaa Glu	gcc Ala 170	gag Glu	ttc Phe	act Thr	ggg Gly	tat Tyr 175	gga Gly	528
aaa Lys	gct Ala	aca Thr	ctg Leu 180	gaa Glu	tgc Cys	cag Gln	gtg Val	caa Gln 185	act Thr	gcg Ala	gtg Val	gac Asp	ttt Phe 190	ggt Gly	aac Asn	576
agt Ser	tac Tyr	atc Ile 195	gct Ala	gag Glu	atg Met	gaa Glu	aaa Lys 200	gag Glu	agc Ser	tgg Trp	ata Ile	gtg Val 205	gac Asp	aga Arg	cag Gln	624
tgg Trp	gcc Ala 210	cag Gln	gac Asp	ttg Leu	acc Thr	ctg Leu 215	cca Pro	tgg Trp	cag Gln	agt Ser	gga Gly 220	agt Ser	ggc Gly	ggg Gly	gtg Val	672
tgg Trp	aga Arg	gag Glu	atg Met	cat His	cat His	ctt Leu	gtc Val	gaa Glu	ttt Phe	gaa Glu	cct Pro	ccg Pro	cat His	gcc Ala	gcc Ala	720

30

225				230				235				240				
act	atc	aga	gta	ctg	gcc	ctg	gga	aac	cag	gaa	ggc	tcc	ttg	aaa	aca	768
Thr	Ile	Arg	Val	Leu	Ala	Leu	Gly	Asn	Gln	Glu	Gly	Ser	Leu	Lys	Thr	
245				250				255								
gct	ctt	acc	ggc	gca	atg	agg	gtt	aca	aag	gac	aca	aat	gac	aac	aac	816
Ala	Leu	Thr	Gly	Ala	Met	Arg	Val	Thr	Lys	Asp	Thr	Asn	Asp	Asn	Asn	
260				265				270								
ctt	tac	aaa	cta	cat	ggt	gga	cat	gtt	tcc	tgc	aga	gtg	aaa	ttg	tca	864
Leu	Tyr	Lys	Leu	His	Gly	Gly	His	Val	Ser	Cys	Arg	Val	Lys	Leu	Ser	
275				280				285								
gct	ttg	aca	ctc	aag	ggg	aca	tcc	tac	aaa	atg	tgc	act	gac	aaa	atg	912
Ala	Leu	Thr	Leu	Lys	Gly	Thr	Ser	Tyr	Lys	Met	Cys	Thr	Asp	Lys	Met	
290				295				300								
tct	ttt	gtc	aag	aac	cca	act	gac	act	ggc	cat	ggc	act	gtt	gtg	atg	960
Ser	Phe	Val	Lys	Asn	Pro	Thr	Asp	Thr	Gly	His	Gly	Thr	Val	Val	Met	
305				310				315				320				
cag	gtg	aga	gtg	cca	aaa	gga	gcc	ccc	tgc	agg	att	cca	gtg	ata	gta	1008
Gln	Val	Arg	Val	Pro	Lys	Gly	Ala	Pro	Cys	Arg	Ile	Pro	Val	Ile	Val	
325				330				335								
gct	gat	gat	ctt	aca	gcg	gca	atc	aat	aaa	ggc	att	ttg	gtt	aca	gtt	1056
Ala	Asp	Asp	Leu	Thr	Ala	Ala	Ile	Asn	Lys	Gly	Ile	Leu	Val	Thr	Val	
340				345				350								
aac	ccc	atc	gcc	tca	acc	aat	gat	gat	gaa	gtg	ctg	att	gag	gtg	aac	1104
Asn	Pro	Ile	Ala	Ser	Thr	Asn	Asp	Asp	Glu	Val	Leu	Ile	Glu	Val	Asn	
355				360				365								
cca	cct	ttt	gga	gac	agc	tac	att	atc	gtt	ggg	aca	gga	gat	tca	cgt	1152
Pro	Pro	Phe	Gly	Asp	Ser	Tyr	Ile	Ile	Val	Gly	Thr	Gly	Asp	Ser	Arg	
370				375				380								
ctc	act	tac	cag	tgg	cac	aaa	gag	gga	agc	tca	ata	gga	aag	ttg	ttc	1200
Leu	Thr	Tyr	Gln	Trp	His	Lys	Glu	Gly	Ser	Ser	Ile	Gly	Lys	Leu	Phe	
385				390				395				400				
act	cag	acc	atg	aaa	ggc	gcg	gaa	cgc	ctg	gcc	gtc	atg	gga	gac	gcc	1248
Thr	Gln	Thr	Met	Lys	Gly	Ala	Glu	Arg	Leu	Ala	Val	Met	Gly	Asp	Ala	
405				410				415								
gcc	tgg	gat	ttc	agc	tcc	gct	gga	ggg	ttc	ttc	act	tcg	gtt	ggg	aaa	1296
Ala	Trp	Asp	Phe	Ser	Ser	Ala	Gly	Gly	Phe	Phe	Thr	Ser	Val	Gly	Lys	
420				425				430								
gga	att	cat	acg	gtg	ttt	ggc	tct	gcc	ttt	cag	ggg	cta	ttt	ggc	ggc	1344
Gly	Ile	His	Thr	Val	Phe	Gly	Ser	Ala	Phe	Gln	Gly	Leu	Phe	Gly	Gly	
435				440				445								
ttg	aac	tgg	ata	aca	aag	gtc	atc	atg	ggg	gcg	gta	ctc	ata	tgg	gtt	1392
Leu	Asn	Trp	Ile	Thr	Lys	Val	Ile	Met	Gly	Ala	Val	Leu	Ile	Trp	Val	

31

450	455	460	
ggc atc aac aca aga aac atg aca atg tcc atg agc atg atc ttg gta			1440
Gly Ile Asn Thr Arg Asn Met Thr Met Ser Met Ser Met Ile Leu Val			
465	470	475	480
gga gtg atc atg atg ttt ttg tct cta gga gtt ggg gcg			1479
Gly Val Ile Met Met Phe Leu Ser Leu Gly Val Gly Ala			
485	490		

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 <211> 493
 <212> PRT
 <213> Yellow fever virus

<400> 4
 Ala His Cys Ile Gly Ile Thr Asp Arg Asp Phe Ile Glu Gly Val His
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 Gly Gly Thr Trp Val Ser Ala Thr Leu Glu His Gly Lys Cys Val Thr
 20 25 30
 Val Met Ala Pro Asp Lys Pro Ser Leu Asp Ile Ser Leu Glu Thr Val
 35 40 45
 Ala Ile Asp Gly Pro Ala Glu Ala Arg Lys Val Cys Tyr Asn Ala Val
 50 55 60
 Leu Thr His Val Lys Ile Asn Asp Lys Cys Pro Ser Thr Gly Glu Ala
 65 70 75 80
 His Leu Ala Glu Glu Asn Glu Gly Asp Asn Ala Cys Lys Arg Thr Tyr
 85 90 95
 Ser Asp Arg Gly Trp Gly Asn Gly Cys Gly Leu Phe Gly Lys Gly Ser
 100 105 110
 Ile Val Ala Cys Ala Lys Phe Thr Cys Ala Lys Ser Met Ser Leu Phe
 115 120 125
 Glu Val Asp Gln Thr Lys Ile Gln Tyr Val Ile Arg Ala Gln Leu His
 130 135 140
 Val Gly Ala Lys Gln Glu Asn Trp Asn Thr Ala Ile Lys Thr Leu Lys
 145 150 155 160
 Phe Asp Ala Leu Ser Gly Ser Gln Glu Ala Glu Phe Thr Gly Tyr Gly
 165 170 175
 Lys Ala Thr Leu Glu Cys Gln Val Gln Thr Ala Val Asp Phe Gly Asn
 180 185 190
 Ser Tyr Ile Ala Glu Met Glu Lys Glu Ser Trp Ile Val Asp Arg Gln
 195 200 205

32

Trp	Ala	Gln	Asp	Leu	Thr	Leu	Pro	Trp	Gln	Ser	Gly	Ser	Gly	Gly	Val	210	215	220
Trp	Arg	Glu	Met	His	His	Leu	Val	Glu	Phe	Glu	Pro	Pro	His	Ala	Ala	225	230	235
Thr	Ile	Arg	Val	Leu	Ala	Leu	Gly	Asn	Gln	Glu	Gly	Ser	Leu	Lys	Thr	245	250	255
Ala	Leu	Thr	Gly	Ala	Met	Arg	Val	Thr	Lys	Asp	Thr	Asn	Asp	Asn	Asn	260	265	270
Leu	Tyr	Lys	Leu	His	Gly	Gly	His	Val	Ser	Cys	Arg	Val	Lys	Leu	Ser	275	280	285
Ala	Leu	Thr	Leu	Lys	Gly	Thr	Ser	Tyr	Lys	Met	Cys	Thr	Asp	Lys	Met	290	295	300
Ser	Phe	Val	Lys	Asn	Pro	Thr	Asp	Thr	Gly	His	Gly	Thr	Val	Val	Met	305	310	315
Gln	Val	Arg	Val	Pro	Lys	Gly	Ala	Pro	Cys	Arg	Ile	Pro	Val	Ile	Val	325	330	335
Ala	Asp	Asp	Leu	Thr	Ala	Ala	Ile	Asn	Lys	Gly	Ile	Leu	Val	Thr	Val	340	345	350
Asn	Pro	Ile	Ala	Ser	Thr	Asn	Asp	Asp	Glu	Val	Leu	Ile	Glu	Val	Asn	355	360	365
Pro	Pro	Phe	Gly	Asp	Ser	Tyr	Ile	Ile	Val	Gly	Thr	Gly	Asp	Ser	Arg	370	375	380
Leu	Thr	Tyr	Gln	Trp	His	Lys	Glu	Gly	Ser	Ser	Ile	Gly	Lys	Leu	Phe	385	390	395
Thr	Gln	Thr	Met	Lys	Gly	Ala	Glu	Arg	Leu	Ala	Val	Met	Gly	Asp	Ala	405	410	415
Ala	Trp	Asp	Phe	Ser	Ser	Ala	Gly	Gly	Phe	Phe	Thr	Ser	Val	Gly	Lys	420	425	430
Gly	Ile	His	Thr	Val	Phe	Gly	Ser	Ala	Phe	Gln	Gly	Leu	Phe	Gly	Gly	435	440	445
Leu	Asn	Trp	Ile	Thr	Lys	Val	Ile	Met	Gly	Ala	Val	Leu	Ile	Trp	Val	450	455	460
Gly	Ile	Asn	Thr	Arg	Asn	Met	Thr	Met	Ser	Met	Ser	Met	Ile	Leu	Val	465	470	475
Gly	Val	Ile	Met	Met	Phe	Leu	Ser	Leu	Gly	Val	Gly	Ala				485	490	